120. Other parties opposed the addition of GPS specific protection limits for AWS-4 operations. CTIA stated that GPS protection limits are not necessary for AWS-4 operations because the AWS-4 band is located several hundred megahertz away from the GPS band.[384] CTIA further observed that operations in bands much closer to the GPS frequencies, such as the AWS-1 band (1710-1755 MHz; 2110-2155 MHz), operate with an OOBE limit of $43 + 10 \log_{10}(P)$ dB into the GPS band and these operations have not given rise to any complaints of interference to GPS. Instead of adopting OOBE limits, either by rule or by license condition, CTIA recommended that the Commission continue its recent efforts to examine receiver performance and noted that the Commission had recently held a workshop on receiver performance issues.[385] LightSquared also stated that the Commission should focus its efforts to protect GPS by examining GPS receiver reliability standards.[386] Greenwood claimed that the -105dBW/MHz EIRP limit would be reasonable if implemented over time, provided that receiver protection requirements for GPS/GNSS receivers increase to mitigate interference susceptibility.[387] Greenwood, like CTIA, also observed that there are many millions of devices transmitting between the GPS and AWS-4 bands that operate in bands that do not have specific OOBE protection levels for GPS and that are not causing OOBE interference to GPS.[388]

121. *Discussion.* The Commission has long recognized the importance of GPS and our responsibility to ensure that it receives appropriate interference protections from other radiocommunication services. The Commission generally supports the actions of licensees to resolve interference issues raised by other spectrum holders or users through private agreements, where, as is the case here, they are not otherwise inconsistent with Commission rules or policies. Because the prospective licensees of AWS-4 operating authority have reached a private agreement with the industry council representing GPS interests, the USGIC, we believe the most appropriate approach is to require that, as a license condition, the licensees comply with this agreement and the specific GPS protection limits contained therein.[389] This is consistent with the USGIC's request that we "condition AWS-4 licenses with the OOBE limits jointly agreed by DISH and the USGIC."[390] The licenses, moreover, shall remain

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[384] CTIA Reply at 16-17; Letter from Christopher Guttman-McCabe, Vice President, Regulatory Affairs, CTIA—The Wireless Association®, to Marlene H. Dortch, Sec'y, Federal Communications Commission, WT Docket Nos. 12-70, 04-356, ET Docket No. 10-142, at 1-2 (filed Oct. 25, 2012) (*CTIA Oct. 25 Letter*)

[385] CTIA Reply at 16-17, *citing* Office of Engineering and Technology, Wireless Telecommunications Bureau, and Office of Strategic Planning Announce Workshop on "Spectrum Efficiency and Receiver Performance," *Public Notice*, 27 FCC Rcd 2084 (OET, WTB, OSP, rel. Feb. 24, 2012); *see* Letter from Scott K. Bergmann, CTIA—The Wireless Association™, to Marlene H. Dortch, Sec'y, Federal Communications Commission, WT Docket Nos. 12-70, 04-356, ET Docket No. 10-142, at 1 (filed Nov. 30, 2012) ("CTIA reiterated that there is no need for Commission action or GPS-specific regulation in this instance. . . . CTIA encouraged the Commission to decline to adopt unnecessary and inappropriate regulation of, or license condition on, commercial mobile services.").

[386] LightSquared Reply at 3, *citing* Office of Engineering and Technology, Wireless Telecommunications Bureau, and Office of Strategic Planning Announce Workshop on "Spectrum Efficiency and Receiver Performance," *Public Notice*, 27 FCC Rcd 2754 (OET, WTB, OSP, rel. March 9, 2012).

[387] Greenwood Comments at 15-18; Greenwood Reply at 8-9.

[388] Greenwood Comments at 18.

[389] *See DISH-USGIC Sept. 2012 Letter Agreement.*

[390] Letter from F. Michael Swiek, Executive Director United States GPS Industry Council to Marlene H. Dortch, Sec'y, Federal Communications Commission, WT Docket Nos. 12-70, 04-356, ET Docket No. 10-142, at 1 (filed Oct. 9, 2012); *see id.* at 3 (stating that "the forthcoming AWS-4 report and order must include reference to the OOBE values agreed to by DISH and the USGIC, and that the resulting AWS-4 authorizations must reflect that AWS-4 operations will be subject to OOBE limits in the DISH/USGIC agreement for AWS-4").

subject to this license condition in the event that the licensees assign or otherwise transfer the licenses to successors-in-interest or assignees. To the extent that AWS-4 licenses return to the Commission (*e.g.*, for a licensee's failure to meet the construction requirements), the Commission will, prior to reassigning such licenses, consult with NTIA about the need for specific OOBE requirements on the new licenses to protect GPS operations in the 1559-1610 MHz band.[391]

122. In requiring the licensees comply with their voluntary agreement, we need not—and do not—reach the issue of determining whether the record contains sufficient information on whether and, if so, at what level, to establish an OOBE limit rule for protection of GPS from AWS-4 operations. We observe that the USGIC stated that both it and its member Deere believe that the emissions limits for the GPS band for services operating in other frequency bands should be considered on a "case-by-case basis."[392] We make no determination as to whether the limits in the private agreement are appropriate or viable for services operating in other spectrum.

(viii) Interference with Other Bands

123. DISH suggested that we should impose emission limits on the 1995-2000 MHz block and on the 1930-1995 MHz PCS blocks, as well as power limitations for 1995-2000 MHz operations.[393] Establishing such limits are outside the scope of this Report and Order, which sets service rules for AWS-4 spectrum, not the 1995-2000 MHz or 1930-1995 MHz bands. OOBE and power limits for the 1995-2000 MHz band will be addressed in the *H Block NPRM*.[394] To the extent that any party seeks a change in the existing PCS rules, that party is free to petition the Commission for a rule change.

124. Nevertheless, we observe that DISH proposed that the Commission limit 1995-2000 MHz block base station operations by an attenuation of $70 + 10 \log_{10}(P)$ dB at and above 2000 MHz, and later proposed instead that such operations should be attenuated by a factor of $79 + 10 \log_{10}(P)$ dB at and above 2005 MHz.[395] Similarly, DISH suggested that the in-band transmit power of operations in the 1995-2000 MHz band should be significantly reduced, i.e., that this should be a low power band.[396] These proposals could reduce the usability of the 1995-2000 MHz band. Such limits appear to be inconsistent with our general finding that the public interest, consistent with the Spectrum Act, is best served by preserving the usability of 1995-2000 MHz even if there is a possibility of reduced usability of the lower portion of the AWS-4 uplink band. Thus, we caution any licensee of AWS-4 operating authority against designing or deploying its network (except at its own risk) assuming either of these levels of OOBE protection for the 2000-2005 MHz band from the 1995-2000 MHz band or low power limits in the 1995-2000 MHz band. As noted below, the Commission will not take action to protect licensees of AWS-4 operating authority from interference that arises in such a scenario.[397] We expect that licensees and their equipment suppliers

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[391] *See infra* Section III.F (Applications for Any AWS-4 Spectrum Returned to the Commission).

[392] Letter from Stephen D. Baruch, Counsel for the United States GPS Industry Council, to Marlene H. Dortch, Sec'y, Federal Communications Commission, WT Docket Nos. 12-70, 04-356, ET Docket No. 10-142, at 1 (filed Oct. 9, 2012) ("The participants also discussed the USGIC's position that the potential interfering capability of other services should be considered on a case-by-case basis (particularly for bands operating closer in frequency to the RNSS bands)."); *DISH-USGIC Sep. 2012 Letter Agreement* at 2 n.2 ("Deere & Company, however, does support an evaluation of the appropriate OOBE limits on a case-by-case basis with respect to other bands.").

[393] DISH Comments at 28; *DISH Dec.3 Letter* at 3; *DISH Dec. 7 Letter* at 6-7.

[394] *See H Block NPRM*, at ¶¶ 34-37.

[395] *See e.g. DISH Dec.3 Letter* at 3.

[396] DISH Comments at 28.

[397] *See infra* Section III.B.5. (Acceptance of Interference into the AWS-4 Uplink Band).

will take this warning into account when establishing technical specifications, including industry standards, and procuring equipment for the band. To the extent that satellite receivers have already been deployed, which could suffer reductions in performance if full power services are deployed in 1995-2000 MHz,[398] we note that our proceeding proposing full power flexible use for 1995-2000 MHz has been open since 2004, before satellites operating in the 2000-2020 MHz band were launched, or even likely designed.[399] Therefore, we expect that the satellites were designed with this overload scenario in mind and there should, therefore, be no impact to MSS. To the extent this is not the case, we do not expect to limit use of 1995-2000 MHz due to any limitations of receivers deployed after our proceeding on use of 1995-2000 MHz was opened.

2. Co-Channel Interference Among AWS-4 Systems

125. Co-channel interference rules prevent harmful interference between geographically adjacent licenses operating in the same spectrum. Specifically, to avoid this interference, the Commission adopts field strength limits that apply at the geographic edge of the license area. In the *AWS-4 NPRM*, the Commission proposed that the current AWS-1 signal strength limit be applied to AWS-4 operations.[400] Because we are licensing AWS-4 spectrum in geographic service areas that are smaller than nationwide, we must adopt signal strength limits here.[401] With no commenters opposing this proposal, we conclude that the benefits of our proposal outweigh any potential costs. As we are basing our technical rules generally on AWS-1 rules where applicable, we continue to believe it appropriate to adopt the AWS-1 co-channel interference requirements for AWS-4. Thus we adopt the proposed co-channel interference levels and expand Section 27.55(a)(1) of the Commission's rules to include the 2180-2200 MHz band.[402] We observe, however, that the assignment approach we adopt below likely will result in an individual licensee obtaining assignments for geographically adjacent AWS-4 EA licenses. In such a scenario, that licensee may choose not to observe this signal strength limit between its geographically adjacent AWS-4 licenses, so long as it complies with other Commission rules and the adjacent affected service area licensee(s) agree(s) to a different field strength.[403]

3. Receiver Performance

126. *Background*: We invited comments on any potential overload interference that may be caused by AWS-4 transmitters or other transmitters that may cause overload interference to AWS-4 receivers. We also asked for characteristics of such receivers, potential mitigation solutions to overload interference and an assessment of the impact to deployment of AWS-4 service.[404] On March 12, 2012, the Commission hosted a two-day workshop on Spectrum Efficiency where various industry and federal participants discussed the role of receivers in enabling access to spectrum for new services.[405] The FCC's

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[398] DISH Comments at 28.

[399] *See AWS Sixth Report and Order*, 19 FCC Rcd at 20739 ¶ 39 ("We also find that due to similar characteristics and proximity to Broadband PCS, the 1915-1920 MHz and 1995-2000 MHz band pairing is comparable to the 1910-1915 MHz and 1990-1995 MHz band pairing"); *see also 2008 Further Notice* 23 FCC Rcd at 9860-61 ¶ 4 (proposing 1995-2000 MHz be used for base station use).

[400] *AWS-4 NPRM*, 27 FCC Rcd at 3582 ¶ 65.

[401] *See supra* Section III.A.3. (Geographic Area Licensing).

[402] 47 C.F.R. § 27.55(a)(1).

[403] *See* 47 C.F.R. § 27.55(a).

[404] *AWS-4 NPRM*, 27 FCC Rcd at 3581-82 ¶¶ 56.

[405] *See* http://www.fcc.gov/events/workshop-spectrum-efficiency-and-receivers-day-1 (last visited Dec. 4, 2012).

Technological Advisory Council (TAC) has also created a "Receiver and Spectrum Working Group" for 2012, which presented its interim recommendations at the September 24, 2012, TAC meeting.[406] The Spectrum Act also directed the U.S. Government Accountability Office to conduct a study on receiver performance and spectrum efficiency and issue a report by February 2013.[407]

127. *Discussion*: Various parties have commented on the receiver performance. LightSquared, Greenwood, CTIA, and NRTC suggested that the Commission continue its recent efforts on receiver performance.[408] Silicon Flatirons introduced the concept of "Interference Limit" as an alternative to receiver standard. It defined the "Interference Limit" as a profile of field strength density over frequency that a receiver should tolerate before claiming interference, and suggested that this concept, as opposed to a receiver standard, be applied to the AWS-4 band.[409]

128. We decline to address receiver performance issues at this time due to lack of details and discussions from commenters. As suggested by commenters, we will continue our efforts to collaborate with multiple stakeholders on receiver performance and establish a path forward based on the various inputs from interested parties, including the final recommendations of the TAC Working Group.

4. Power Limits

129. The Commission sought comment on appropriate power limits for terrestrial operations in the AWS-4 band.[410] Specifically, the Commission proposed to apply existing AWS-1 power limits for both base and mobile stations in the AWS-4 bands.[411] As discussed below, we adopt the Commission's proposed power limit for base stations. For mobile operations we adopt a power limit of 2 watts total equivalent isotropically radiated power (EIRP) with the additional constraint that total power between 2000-2005 MHz be limited to 5 milliwatts EIRP.

a. Base Stations

(i) Background

130. The Commission made three proposals in the *AWS-4 NPRM* relating to power limits for base stations operating in the AWS-4 bands. These proposals would generally apply the AWS-1 base station power limits for AWS-4 base stations, adjusting any coordination requirements to account for AWS-4 spectrum being adjacent to different spectrum bands than AWS-1 spectrum.[412] AWS-1 rules limit base station power in non-rural areas to 1640 watts EIRP for emission bandwidths less than 1 MHz and to 1640 watts per MHz EIRP for emission bandwidths greater than 1 MHz, and double these limits (3280 watts EIRP and 3280 watts/MHz EIRP) in rural areas.[413]

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[406] *See* http://transition.fcc.gov/bureaus/oet/tac/tacdocs/meeting92412/TAC-9-24-12-Presentations.pdf (last visited Dec. 4, 2012).

[407] *See* Spectrum Act § 6408(a).

[408] LightSquared Reply at 7; Greenwood Comments at 18; CTIA Reply at 17; NRTC Comments at 10.

[409] Silicon Flatirons Comments at 5-6, 8.

[410] *AWS-4 NPRM*, 27 FCC Rcd at 3581-82 ¶¶ 57-61.

[411] *Id.*

[412] *Id.*

[413] 47 C.F.R. § 27.50(d); *ICO Waiver Order*, 24 FCC Rcd at 188 ¶ 47; *TerreStar Waiver Order*, 25 FCC Rcd at 235-236 ¶¶ 23-24.

131. First, the Commission proposed power limits for base stations in non-rural areas. To best allow flexibility in the use of various bandwidths, the Commission proposed applying the limits of the existing AWS-1 rule of (1) 1640 watts EIRP for emissions less than 1 megahertz and (2) 1640 watts/MHz EIRP for emissions over 1 megahertz.[414] The Commission also discussed the MSS/ATC base station power limits set forth in the Commissions Part 25 rules and in the 2 GHz license authorizations, which vary somewhat from the AWS-1 rules.[415]

132. Second, the Commission proposed setting the AWS-4 power limits for base stations operating in rural areas to the limits set forth in sections 27.50(d)(1)-(2) for AWS-1 base station operations, which are double the limits for non-rural areas (i.e., 3 dB higher).[416] We noted in the AWS-4 NPRM that the Commission had not previously considered whether the higher power level of 3280 watts EIRP allowed for rural AWS-1 base stations is appropriate for 2180-2200 MHz.[417] In the *AWS-4 NPRM*, the Commission proposed to allow the increase of these power levels to 3280 watts EIRP for emissions less than 1 MHz and 3280 watts/MHz EIRP for emissions over 1 MHz in rural areas in an effort to further the goal of rural deployment of broadband services.[418]

133. Third, the Commission proposed that AWS-4 base stations with transmit power above 1640 watts EIRP and 1640 watts / MHz EIRP be required to coordinate with users in adjacent AWS blocks located within 120 kilometers.[419] The Commission made this proposal because it is equivalent to the AWS-1 coordination requirements as adjusted to account for differences in which bands are adjacent to AWS-1 and AWS-4 spectrum, respectively.[420]

(ii) Discussion

134. We adopt the three base station power limit proposals detailed in the *AWS-4 NPRM*. As we explain throughout this order, we base our technical rules on those in place for AWS-1 spectrum. The proposed rules are based on those for AWS-1, and we received no comments opposing the rules. Thus, we adopt the proposal to limit AWS-4 base stations to 1640 watts EIRP for emissions less than 1 MHz and 1640 watts/MHz EIRP for emissions over 1 MHz for non-rural areas; the proposal to set AWS-4 power limits for base stations operating in rural areas at the limits specified in 27.50(d)(1-2) of the Commission's rules;[421] and the proposal that AWS-4 base stations with transmit power above 1640 watts EIRP and 1640 watts/MHz EIRP be required to coordinate with users in adjacent AWS blocks located within 120 kilometers. These power limits will help ensure robust service in the AWS-4 bands, while also helping to minimize harmful interference into other bands. No commenters opposed these proposals.

[414] *AWS-4 NPRM*, 27 FCC Rcd 3581 ¶ 58.

[415] *See* 47 C.F.R. § 25.252 (a)(2).

[416] *AWS-4 NPRM*, 27 FCC Rcd 3581 ¶ 59.

[417] These higher power levels for rural areas were not considered because they were not requested in the waivers.

[418] *AWS-4 NPRM*, 27 FCC Rcd 3581 ¶ 59.

[419] *Id.* at 3581-3582 ¶ 60.

[420] *AWS-4 NPRM*, 27 FCC Rcd at 3581-3582 ¶ 60.

[421] 47 C.F.R. §§ 27.50(d)(1-2).

b. Mobile Stations

(i) Background

135. Commission rules governing ATC operations set a power limit of 1.0 dBW (1.25 watts) EIRP in a bandwidth of 1.23 MHz for mobiles operating in the 2000-2020 MHz band,[422] while AWS-1 rules set the power limit for mobile operations at 1 watt EIRP.[423] In the *AWS-4 NPRM*, the Commission suggested that the AWS-1 mobile power limit is somewhat more restrictive than the ATC rules and, because these two limits are similar, that the AWS-1 limit found in 27.50(d)(4) should be applied to mobile operations in AWS-4.[424] DISH argues for a 2 watt mobile power limit, asserting both that "the PCS power limit and its Part 27 counterpart, the 2 watt limit applicable to BRS/EBS, are more appropriate references for AWS-4" than is the AWS-1 power limit and that the ATC rule, because it specifies power spectral density (PSD) rather than a total power, allows more power, for example, 3 dBW in a 5 MHz bandwidth.[425] No other parties argued for or against a 1 watt or 2 watt limit for mobile stations.

(ii) Discussion

136. We adopt the following power limits for AWS-4 mobile operations. First, we adopt a limit of 2 watts equivalent isotropically radiated power (EIRP) for the total power of a device operating in the AWS-4 uplink. Then, to protect future operations in the adjacent 1995-2000 MHz band, we also limit the power of the portion of a device's transmission that falls into 2000-2005 MHz to 5 milliwatts. Our adoption of these requirements is based on the following technical analysis.

137. First, we consider the total mobile power for the AWS-4 uplink band. Although we generally are applying AWS-1 technical rules to AWS-4, here we adopt the 2 watt EIRP power limit proposed by DISH. No party opposed this proposal. We find that DISH is correct in its understanding of the ATC rule, and a 2 watt power limit is more restrictive than the existing ATC rules in the case of large bandwidths, which may be deployed in this band. Conversely, we note that keeping the PSD-based ATC rule would unnecessarily limit flexibility, and it could restrict the use of narrow transmission bandwidths, such as an LTE mobile transmitting on only a few resource blocks. We agree with DISH that a 2 watt EIRP for AWS-4 mobiles will provide adequate protection to PCS mobiles operating at 1990-1995 MHz.

138. Second, as discussed above,[426] to promote the best and highest use of spectrum, to fulfill our statutory obligations, and to maintain consistency with past Commission actions, we determine that it is in the public interest to ensure the efficient and robust use of both the 1995-2000 MHz band and the AWS-4 band, even if that results in adopting targeted rules that partially limit the usability of a portion of the AWS-4 uplink band. For these reasons, above we establish specific attenuation requirements to address interference from AWS-4 OOBE into the 1995-2000 MHz band.[427] OOBE limits do not, however, address overload issues. Overload interference can occur in a receiver when it receives signals *outside of the frequencies* of the desired signal, especially if they are of a much higher power than the desired signal. Overload interference can be managed by improving receiver performance through filtering or other techniques, or by placing transmit power limitations on the authorized frequencies of the potential interferer. We find below that a balance of expected improved performance for receivers in

[422] *See* 47 C.F.R. § 25.252(b)(1).

[423] *See* 47 C.F.R. § 27.50(d)(4).

[424] *AWS-4 NPRM*, 27 FCC Rcd at 3582 ¶ 61.

[425] DISH Comments at 30.

[426] *See supra* Section III.B.1.b.ii. (Interference with operations in 1995-2000 MHz).

[427] *Id.*

1995-2000 MHz (relative to typical specifications) and establishing power limitations on AWS-4 operations in the 2000-2005 MHz band best mitigates the possibility of mobile-to-mobile interference from the AWS-4 uplink band to the 1995-2000 MHz band.[428]

139. As detailed below, to establish the appropriate power limitations for AWS-4 operations in 2000-2005 MHz we make several calculations. First, we determine the signal level that future mobiles operating in the 1995-2000 MHz band can tolerate in an adjacent band, considering both the desired signal and the undesired signal levels, that is, the blocking performance. Next, we describe the user environment under which interference can reasonably be prevented. The environment defines the path losses between the interfering AWS-4 mobile and the 1995-2000 MHz receiver. Then, we establish power limits on the AWS-4 mobiles by applying the path losses to the maximum interfering signal level to work back to the allowable transmitter power.

140. *Blocking Performance.* As the Commission has not yet adopted rules for the 1995-2000 MHz band, and does not have receiver standards for comparable bands, to calculate the level of overload interference that we anticipate future mobile receivers operating in the 1995-2000 MHz band will tolerate we must turn to other sources. With the rapid adoption of 4G mobile broadband technologies, LTE is a technology commonly being deployed today. We use the 3GPP specifications for LTE user equipment (UE) operating in the nearby PCS band, band 25 (1930-1995 MHz).[429] Although these 3GPP LTE specifications are applicable to user equipment operating in 1930-1995 MHz, not 1995-2000 MHz, and are specific to LTE devices, we feel they are a reasonable indication of the likely performance of future 1995-2000 MHz band devices.

141. In the 3GPP specifications for LTE, blocking performance is specified with a desired signal 6 dB above the reference sensitivity.[430] For a device operating in the 1930-1995 MHz band (band 25) on a 5 megahertz channel, the reference sensitivity is -96.5 dBm.[431] Thus, the desired signal is -90.5 dBm. Next we determine the level of the undesired signal. For interferers on the adjacent channel, the 3GPP standard specifies the ratio of the undesired to desired signal level, termed the adjacent channel selectivity (ACS), rather than an absolute blocking level.[432] For band 25, assuming 5 MHz carriers, the ACS is 33 dB, resulting in -57.5 dBm as the level of undesired signal that the receiver must tolerate.[433]

142. *User Environment.* The interference scenario that has been discussed in the record is where a handheld AWS-4 mobile transmitter and a handheld PCS mobile receiver are in close proximity.[434] Based on the parameters provided in the comments of Motorola Mobility, which we find reasonable with the modification that the body loss applies to both devices as discussed above,[435] the characteristics of this environment are:

- Mobiles are separated by 2 meters

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[428] As discussed above, we are not establishing receiver performance requirements at this time. *See supra* III.B.3. (Receiver Performance).

[429] *LTE RF Standard for UEs* at 20.

[430] *LTE RF Standard for UEs* at 86.

[431] *LTE RF Standard for UEs* at 78.

[432] *LTE RF Standard for UEs* at 83-85.

[433] *LTE RF Standard for UEs* at 83.

[434] Motorola Comments, Technical App. at A-1.

[435] *See supra* ¶ 85.

- The mobiles are in line of sight conditions, experiencing free space path loss (FSPL)
  FSPL (dB) = 20 log (d) + 20 log (f) – 27.55,
  where d = distance in meters and f = frequency in MHz.
  For a 2 meter separation and 2000 MHz transmit frequency, this translates to
  FSPL = 20 log(2) + 20 log (2000)- 27.55 = 44.5 dB,
- Each mobile (TxAntGain, RxAntGain) has a combined antenna gain and head/body loss of -10 dB
- Total path losses = TxAntGain + FSPL + RxAntGain = 10 + 44.5 + 10 = 64.5 dB

143. *Power Limitation.* The allowable transmitter power for AWS-4 is thus calculated by adding the path losses of 64.5 dB to the maximum level of the undesired signal level of -57.5 dBm. Hence, we arrive at a transmitter power level of 7 dBm, which is equivalent to 5 milliwatts. Accordingly, we find that the limit on the total EIRP of AWS-4 mobiles in 2000-2005 MHz must be at most 5 milliwatts. We recognize that carriers larger than 5 MHz may be deployed in the AWS-4 spectrum, and therefore, this power limit may in some cases apply to only a portion of the total power transmitted by the mobile. Therefore, we allow a device to transmit a total of 2 watts EIRP, as long as the portion of the device's transmission in 2000-2005 MHz is limited to an EIRP of 5 milliwatts.

144. *Comparison to OOBE limit.* To confirm the appropriateness of this limit, we compare the effect of overload interference to the 1995-2000 MHz band to OOBE interference to the 1995-2000 MHz band. As discussed above,[436] we establish an OOBE attenuation of 70 + 10 $\log_{10}$(P) below 2000 MHz for AWS-4 uplink transmissions. This corresponds to a level of -40 dBm/MHz. Applying the same isolation of 64.5 dB for 2 meters of separation, this means the level present at the 1995-2000 MHz receiver is -104.5 dBm/MHz. This is 3 dB below Motorola's suggested typical noise floor of -101.5 dBm/MHz, consisting of thermal noise of -114 dBm/MHz plus a 12.5 dB noise figure.[437] This is an approximately 2 dB noise rise or desensitization, close to the 3 dB desensitization Motorola recommends as a threshold of interference.[438] So the OOBE attenuation of 70 + 10 $\log_{10}$(P) and power limitation of 5 milliwatts are well balanced, with neither one allowing significantly higher probability of interference than the other.

145. *Receiver Improvements.* We note that using standard 3GPP blocking specifications, similar analysis would also imply the need for power reductions in 2005-2020 MHz. However, we believe that future equipment for the 1995-2000 MHz band should be able to exceed these specifications, if licensees find it necessary to do so. We impose power restrictions only in the first 5 megahertz because of the difficulty of improving filter performance in the first 5 megahertz adjacent to a band.

146. *Private Agreements.* We recognize that further improvement of the performance of receivers in 1995-2000 MHz band, as well as willingness on the part of licensees of the 1995-2000 MHz band to accept a higher probability of interference, could reduce or eliminate the need for power restrictions in 2000-2005 MHz. Therefore, we allow for licensees of AWS-4 authority to enter into private operator-to-operator agreements with all 1995-2000 MHz licensees to operate in 2000-2005 MHz at power levels above 5 milliwatts EIRP. In no case, however, may the total power of the AWS-4 mobile emissions exceed 2 watts EIRP.

147. *Alternate proposal.* As discussed above,[439] DISH also proposed a combination of rules and commitments that it says will allow full use of the 1995-2000 MHz band while preventing any 3GPP

[436] *See supra* Section III.B.1.b.ii. (Interference with operations in 1995-2000 MHz).

[437] Motorola Comments, Technical App. at A-1.

[438] *Id.*

[439] *See supra* ¶ 70.

delay.[440] In particular, part of this proposal is that DISH will designate 2000-2005 MHz as a terrestrial guard band, and DISH's devices will not transmit on those frequencies. DISH suggests that this will create more certainty for potential bidders on the1995-2000 MHz band than a power limitation such as we adopt here, and that its proposal will therefore increase the usability of that band.[441] However, we do not adopt any rules prohibiting transmission in 2000-2005 MHz, as establishing calibrated technical limits with the flexibility to be modified via private agreements allows technical and business solutions that increase the usability of this spectrum if needed, whereas a rule such as proposed by DISH would foreclose any productive use of the spectrum. We also do not believe that DISH's proposal will increase the usability of the 1995-2000 MHz band over the rules we adopt here, which adequately protect the 1995-2000 MHz band through a combination of OOBE limits and power limitations.

148. In sum, we decline to adopt the proposed power limit of 1 watt EIRP for mobiles. Rather, we set power limits for mobile operations in the 2000-2020 MHz band as follows: the total power of the mobile is limited to 2 watts EIRP for emissions in 2000-2020 MHz, and is limited to 5 milliwatts EIRP for the portion of any emission that falls into 2000-2005 MHz, except as provided for by private agreement between a licensee of AWS-4 operating authority and all 1995-2000 MHz licensees. No party presented data on the costs associated with different mobile power limits. Thus, given the record before us, we conclude that the potential benefits of our adopted mobile station power limit would outweigh any potential costs.

5. Acceptance of Interference into the AWS-4 Uplink Band.

149. As discussed earlier, the Commission looks to maximize the flexible use of both the AWS-4 and the 1995-2000 MHz bands to enable deployment of full, robust, commercial service for mobile broadband. And, as discussed above, to promote the best and highest use of spectrum, fulfill our statutory obligations, and to maintain consistency with past Commission actions, we determine that it is in the public interest to ensure the efficient and robust use of both the 1995-2000 MHz band and the AWS-4 band, even if that results in adopting targeted rules that partially limit the usability of a portion of the AWS-4 uplink band.[442] To this end, we have prescribed both power and emission limits on the AWS-4 mobile transmitters to prevent interference to the mobile receivers in the 1995-2000 MHz band. The Commission anticipates that the new technical rules to be provided in a forthcoming rulemaking for operation in the 1995-2000 MHz band will address interference to AWS-4 operations.[443] Even with appropriate technical rules and good engineering practice, where uplink and downlink operations are so closely located, there will remain a potential for base stations in the 1995-2000 MHz band to interfere with the AWS-4 base station receivers. Further, although we are not adopting rules limiting the operations of MSS mobile transmitters, the proximity of uplink and downlink operations also raises the potential for 1995-2000 MHz band base stations to interfere with MSS satellite receivers. Therefore, to the extent that future operations in the 1995-2000 MHz band, operating within the rules established for use of the 1995-2000 MHz band, cause harmful interference to AWS-4 operations or MSS operations due

[440] *See DISH Dec. 3 Letter*; *DISH Dec. 7 Letter*.

[441] *See DISH Dec. 7 Letter* at 3.

[442] Again, as stated above, we disagree with DISH's assertion that the Commission has a "first-in-time" policy that requires us to grant DISH "full rights" to use AWS-4 spectrum and, only thereafter, begin to examine the rules for the 1995-2000 MHz band. *See DISH Nov. 26 Ex Parte Letter* at 3. We are aware of no Commission rule requiring the application of a generic first-in-time priority between adjacent spectrum bands. *See supra* n.232.

[443] *See H Block NPRM*, at ¶¶ 35-37.

to either OOBE in the 2000-2005 MHz portion of the AWS-4 and 2 GHz MSS uplink band or in-band power in 1995-2000 MHz, AWS-4 and 2 GHz MSS licensees must accept this interference.[444]

150. We emphasize that we limit the acceptance of OOBE interference to the 2000-2005 MHz portion of the AWS-4 and 2 GHz MSS bands. However, should in band interference occur due to the power in 1995-2000 MHz overloading receivers above 2000 MHz, this overload can potentially affect the entire receive band. Overload interference can be prevented by improved receive filters. Therefore, if a licensee of AWS-4 operating authority determines such filters are necessary, the impact to the uplink band is limited to the transition band of the filter, not the entire band. Such a transition band would be less than 5 megahertz,[445] thus the impact would be limited to (at most) the 2000-2005 MHz portion of the AWS-4 bands, and there is no legacy equipment impact, as ATC service has not been deployed. Finally, we note that unlike the terrestrial service, MSS has been deployed in this band, with two satellites launched. Because both satellites were launched well after the Commission initiated the H block proceeding,[446] we expect that they were designed with this overload scenario in mind.[447] Therefore, there should be no impact to MSS. To the extent this is not the case, we do not expect to limit use of 1995-2000 MHz due to any limitations of receivers deployed after our proceeding on use of 1995-2000 MHz was opened.

151. Thus, for the public interest reasons discussed above and because Congress requires us to make available via a system of competitive bidding the 1995-2000 MHz band, we find that the costs of the tailored limitations on the use of the 2000-2005 MHz portion of the AWS-4 band as well as possibly some portion of the 2 GHz MSS band are outweighed by the benefits of enabling full use of the 1995-2000 MHz band and of the 2005-2020 MHz portion of the AWS-4 band.

6. Antenna Height Restrictions

152. In the *AWS-4 NPRM*, the Commission proposed that the flexible antenna height rules applicable to AWS-1 should be also applied to AWS-4 stations.[448] In response, only DISH commented on this issue. As explained below, we adopt the Commission's proposals with minor modifications.

a. Base Stations

(i) Background

153. Part 27 of the Commission's rules does not set out specific antenna height restrictions for AWS-1 base stations. However, pursuant to Section 27.56, all services operating under Part 27 are required to limit base station antenna heights to elevations that do not present a hazard to air navigation.[449] Additionally, the limitations of field strength at the geographical boundary of the license

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[444] We set this rule for the 2000-2005 MHz portion of the band because the record indicates base station transmit filters need 1 to 5 megahertz to roll-off to a low level of emissions. *See* Nokia Reply at 4, Alcatel Comments at 12.

[445] For example, DISH argues for 5 megahertz of transition band to avoid overload. *See DISH Oct. 17 Letter* at 3.

[446] DBSD launched its satellite in April 2008 and TerreStar launched its satellite in July 2009. *AWS-4 NPRM*, 27 FCC Rcd at 3565-66 ¶ 8.

[447] *See AWS Sixth Report and Order*, 19 FCC Rcd at 20739 ¶ 39 ("We also find that due to similar characteristics and proximity to broadband PCS, the 1915-1920 MHz and 1995-2000 MHz band pairings is comparable to the 1910-1915 MHz and 1990-1995 MHz band pairing"); *see also 2008 Further Notice*, 23 FCC Rcd at 9860-61 ¶ 4 (proposing 1995-2000 MHz be used for base station use).

[448] *AWS-4 NPRM*, 27 FCC Rcd at 3582 ¶¶ 62-64.

[449] *See* 47 C.F.R. § 27.56.

discussed above also effectively limit antenna heights.[450] As a result, because of these inherent height limitations, the Commission proposed that unique antenna height limits were not needed for AWS-4 facilities, and that the general height restrictions of Part 27 would be sufficient.[451] We received one comment on this issue, which supported the proposal.[452]

(ii) Discussion

154. We find that, consistent with the Commission's proposal, specific antenna height restriction for AWS-4 base stations are not necessary. As discussed above, the general requirement to not endanger air navigation and the effective height limitations implicitly resulting from our co-channel interference rules obviate the need for specific antenna height restrictions for AWS-4 base stations. Additionally, the sole commenter on this issue supports the Commission's position.[453] Thus, we find specific antenna height restrictions for AWS-4 base stations are not required.

b. Fixed Stations

(i) Background

155. Unlike base stations operating under Part 27, Commission rules specify a height restriction of 10 meters for fixed stations operating in AWS-1 uplink spectrum.[454] As the Commission discussed throughout the *AWS-4 NPRM*, because of the similarities between AWS-1 and AWS-4, we expect use of the AWS-4 bands to be similar to AWS-1 services. Hence, the Commission proposed applying the AWS-1 antenna height restriction of 10 meters to AWS-4.[455]

(ii) Discussion

156. DISH suggests that a height restriction is not necessary for AWS-4 fixed stations, because the uplink operations of AWS-4 will be more similar to BRS/EBS than AWS-1.[456] The 10 meter height limit was adopted in AWS-1 specifically to protect the Federal operations in the 1710-1755 MHz band and the adjacent Federal bands above and below.[457] Outside of this specific case, the Commission has not found a 10 meter height restriction necessary for other terrestrial mobile bands, such as BRS/EBS or PCS. No other comments were received on this issue. Because the AWS-4 uplink band at 2000-2020 MHz is not adjacent to Federal operations, and to promote flexibility in the use of AWS-4 spectrum, we decline to adopt a height limitation for fixed stations in the AWS-4 uplink band.

7. Canadian and Mexican Coordination

157. Because of our shared border with Canada and Mexico, the Commission routinely works in conjunction with the United States Department of State and Canadian and Mexican government officials to ensure efficient use of the spectrum as well as interference-free operations in the border areas. Until such time as any adjusted agreements, as needed, between the United States, Mexico and/or Canada can be agreed to, operations must not cause harmful interference across the border, consistent with the

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[450] *See supra* Section III.B.2. (Co-Channel Interference Among AWS-4 Systems).

[451] *AWS-4 NPRM*, 27 FCC Rcd at 3582 ¶ 63.

[452] DISH Comments at 30.

[453] DISH Comments at 30.

[454] *See* 47 C.F.R. § 27.50(d).

[455] *AWS-4 NPRM*, 27 FCC Rcd at 3582 ¶ 64.

[456] DISH Comments at 30-31.

[457] *AWS-1 Report and Order*, 18 FCC Rcd at 25204 n. 279.

terms of the agreements currently in force.[458] We note that further modifications of the rules might be necessary in order to comply with any future agreements with Canada and Mexico regarding the use of these bands.

8. Other Technical Issues

158. In addition to the specific technical issues addressed above, the Commission also proposed applying additional Part 27 rules to the AWS-4 band.[459] Specifically, the Commission proposed applying the following rule sections: 27.51 Equipment authorization, 27.52 RF safety, 27.54 Frequency stability, 27.56 Antennas structures; air navigation safety, and 27.63 Disturbance of AM broadcast station antenna patterns.[460] The Commission reasoned that because AWS-4 will be a Part 27 service, these rules should apply to all licensees of AWS-4 terrestrial authority, including those who acquire licenses through partitioning or disaggregation.[461] No commenters opposed this proposal. Accordingly, because these rules generally apply to all Part 27 services, and because, as we explain below, we find it appropriate to license the AWS-4 spectrum under our Part 27 regulatory framework,[462] we conclude that the potential benefits of our proposal would outweigh any potential costs and adopt the proposal to apply these additional Part 27 rules to licensees of AWS-4 authority.

C. Protection of MSS Operations

159. *Background.* As explained above, the Commission allocated 2 GHz spectrum for Mobile Satellite use in 1997 and issued MSS authorizations between 2001 and 2005.[463] Subsequently, in 2011, the Commission added co-primary Fixed and Mobile allocations to the band, but stated that MSS would remain co-primary in the 2 GHz MSS band.[464] In adding the terrestrial allocations, the Commission explained that the new allocation would "not result in harmful interference, and would not inevitably lead to uses that would result in harmful interference," as no terrestrial service rules yet existed for the band (other than the pre-existing MSS/ATC rules).[465] Most recently, with the *AWS-4 NPRM*, the Commission proposed to establish terrestrial service rules for the 2 GHz band. Consequently, to ensure that the addition of full terrestrial operations in the 2 GHz band does not result in harmful interference to 2 GHz MSS operations, the Commission proposed a rule requiring that any licensee of AWS-4 operating authority protect 2 GHz MSS operations from harmful interference.[466]

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[458] The list of agreements includes the "Protocol Concerning the Transmission and Reception of Signals from Satellites for the Provisions of Mobile-Satellite Services and Associated Feeder links in the United States of America and the United Mexican States."

[459] *AWS-4 NPRM*, 27 FCC Rcd at 3583 ¶ 67.

[460] *Id.*; 47 C.F.R. §§ 27.51, 27.52, 27.54, 27.56, 27.63.

[461] *AWS-4 NPRM*, 27 FCC Rcd at 3583 ¶ 67.

[462] *See infra* Section III.G.1.b. (Regulatory Framework).

[463] *See* Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service, ET Docket No. 95-18, *First Report and Order and Further Notice of Proposed Rule Making*, 12 FCC Rcd 7388 (1997) (allocating 2 GHz spectrum for Mobile Satellite use); *AWS-4 NPRM*, 27 FCC Rcd at 3564, 3565-66 ¶¶ 4, 7-8 (discussing history of MSS in the 2 GHz band).

[464] *2 GHz Band Co-Allocation Report and Order*, 26 FCC Rcd at 5715 ¶ 10.

[465] *Id.* at 5715-16 ¶ 13.

[466] *AWS-4 NPRM*, 27 FCC Rcd at 3583 ¶ 68.

160. *Discussion.* We adopt a rule concerning protection of MSS operations in the 2 GHz band. The rule requires that AWS-4 operations not cause harmful interference to 2 GHz MSS operations and accept any interference received from duly authorized 2 GHz MSS operations. Further, with no commenters opposing the proposed MSS protection rules, we conclude that the benefits of these rules would outweigh any potential costs. As detailed more fully below,[467] the approach adopted also involves reliance upon rapid terrestrial build-out by the licensees, with potential loss of MSS interference protection in the event terrestrial services are not built out.[468] Finally, we observe that, should a licensee of AWS-4 operating authority who also possesses 2 GHz MSS operating authority fail to satisfy its AWS-4 Final Build-out Requirement in an EA, among other things, the MSS protection rule (discussed in this paragraph) shall not apply to that EA.[469]

D. Assignment of AWS-4 Operating Authority

161. License assignment refers to the process by which the Commission grants an entity the right to use specified channels or frequencies of radio transmission for a specified period of time; no ownership right is conveyed to the licensee.[470] Sections 307-309 of the Communications Act generally govern the initial assignment of licenses.[471] Section 316 governs the modification of Commission licenses.[472] As discussed below, we propose to modify, pursuant to our Section 316 authority, the incumbent 2 GHz MSS authorization holders' licenses to include AWS-4 terrestrial spectrum rights.

162. Specifically, we propose to modify the existing MSS licenses to add Part 27 rights and obligations for AWS-4 terrestrial spectrum use with all of the attendant rights, limitations, and obligations associated with the AWS-4 service rules we adopt herein. We find that a section 316 license modification approach is the best course of action because it is the most efficient and quickest path to enabling flexible terrestrial use of this band while ensuring compliance with the MSS protection rule described above.[473]

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[467] *See infra* Section III.E. (Performance Requirements)

[468] This approach is incompatible with deployment of additional MSS systems in the band, and therefore we do not anticipate accepting applications for new or modified MSS operations, except from an incumbent operator or its assignee or transferee. Accordingly, we delegate authority to the International Bureau to dismiss, upon acceptance by the incumbent MSS licensees of modified licenses authorizing AWS-4 operations, the "Consolidated Petition for Reconsideration of Inmarsat Ventures Limited and Inmarsat Global Limited," filed January 9, 2006, in IB Docket Nos. 05-220 and 05-221. That petition sought reconsideration premised on the deployment of an additional MSS system in the 2 GHz MSS bands.

[469] *See infra* Section III.E.2.b. (Penalties for Failure to Meet Construction Requirements).

[470] 47 C.F.R. § 2.1 ("Assignment (of a radio frequency or radio frequency channel). Authorization given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions. (RR)"); *see* 47 U.S.C. § 301, stating:

> It is the purpose of this chapter, among other things, to maintain the control of the United States over all the channels of radio transmission; and to provide for the use of such channels, but not the ownership thereof, by persons for limited periods of time, under licenses granted by Federal authority, and no such license shall be construed to create any right, beyond the terms, conditions, and periods of the license. No person shall use or operate any apparatus for the transmission of energy or communications or signals by radio . . . except under and in accordance with this chapter and with a license in that behalf granted under the provisions of this chapter.

[471] 47 U.S.C. §§ 307-309.

[472] 47 U.S.C. § 316.

[473] *See supra* Section III.C. (Protection of MSS Operations).

163. As explained below, we believe that technological difficulties continue to make it impractical today for same band, separate mobile satellite and terrestrial operator sharing of this spectrum, and therefore propose to modify the existing MSS licenses so that satellite and terrestrial services are managed by the same operator. We observe, however, that it may become possible for such same band, separate operator sharing to become technically feasible in the future. For this reason, and for other reasons discussed below, we find it appropriate to permit licensees of AWS-4 operating authority to utilize the Commission's wireless secondary market mechanisms with respect to their terrestrial operating authority.[474]

1. Background

164. In 2003, the Commission established the ATC rules, concluding that any grant of ATC authority would only be to MSS incumbents.[475] The Commission limited ATC authority to the existing MSS licensees because, in part, it determined that separately controlled MSS and terrestrial mobile operations (*i.e.*, two ubiquitous mobile services) in the same band would be "impractical and ill-advised" as the two distinct parties would be unable to overcome technical hurdles to reach a workable sharing arrangement.[476] Technical analyses at the time, moreover, demonstrated that granting a third party the right to use licensed MSS spectrum for terrestrial use could not occur without impacting the rights of the existing satellite licensees.[477]

165. In the *AWS-4 NPRM*, the Commission posited that the complexities of coordination between mobile satellite and terrestrial uses identified by the Commission in 2003 remain, and would continue to render grant of licenses for terrestrial operations to an entity other than the incumbent MSS licensee impractical.[478] The Commission expected that interference problems associated with two or more distinct mobile licensees in the band would continue to call for granting authority for AWS-4 operations to the 2 GHz MSS incumbents.[479] The Commission observed that granting authority for AWS-4 operations terrestrial use to the incumbent MSS licensees would provide them with at least as much ability to provide terrestrial service as their ATC authority does.[480] As a result of these factors, the Commission proposed to assign terrestrial use of AWS-4 spectrum to the incumbent 2 GHz MSS licensees as a means to make additional spectrum available for terrestrial broadband use.[481] The Commission sought comment on this proposal, including on whether technical advances had occurred since 2003 such that separately controlled mobile satellite and terrestrial mobile operations in the same band had become feasible.[482]

166. In response to this proposal, the Commission received numerous comments generally supporting the Commission's position that technical hurdles remain and that granting AWS-4 terrestrial operating authority to an entity other than the MSS incumbent remains impractical.[483] For example,

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[474] *See infra* Section III.G.3. (Secondary Markets).

[475] *See ATC Report and Order*, 18 FCC Rcd 1964 (2003).

[476] *ATC Report and Order*, 18 FCC Rcd at 1991-92 ¶ 49.

[477] *Id.* at 1972-73 ¶ 18.

[478] *AWS-4 NPRM*, 27 FCC Rcd at 3584 ¶ 71.

[479] *Id.*

[480] *Id.*

[481] *Id.* at 3584-85 ¶¶ 72.

[482] *Id.* at 3583-85 ¶¶ 69-73.

[483] *See, e.g.*, Alcatel Comments at 5; DISH Comments at 9-10; SIA Comments at 3; and USGIC Comments at 3-4.

Alcatel states that technical difficulties remain and that co-channel sharing between MSS and terrestrial operations is technically challenging.[484] According to Alcatel, a division of "the frequency block for use by separate MSS and terrestrial licensees would restrict the data rates and capacity of each, far below what a coordinated system would support, greatly impinging on both MSS and terrestrial service capabilities."[485] Similarly, DISH submitted a technical study showing that, to ensure efficient AWS-4 operations, the same operator must control both AWS-4 and MSS using an integrated system.[486] According to the study, an ideal system would operate under a single overall AWS-4/MSS network control facility.[487] A single control facility would diminish the impact of expected interference between AWS-4 operations and MSS operations under separate control.[488] For example, if AWS-4 terrestrial service is provided using Long Term Evolution (LTE) technology, because LTE can be dynamically reassigned, a single operator could dynamically assign channels, power levels, and signal coding to manage system interference.[489] However, if the AWS-4 and MSS systems were independently controlled, each operator would need to have control of the other's system to provide dynamic carrier management—an infeasible situation for two competing systems.[490] According to the study, the only solution in a separately controlled scenario would be to segregate spectral usage in a non-dynamic fashion, which would not enable stable, independent operation of satellite and terrestrial systems.[491] In sum, several commenters assert that adopting the Commission's proposal to assign the AWS-4 licenses to the MSS incumbents presents the most efficient means of putting the spectrum to use and minimizes technical complications related to interference issues, thereby resulting in faster licensing and deployment of AWS-4 spectrum.[492]

167. Additionally, some parties support the Commission's proposal to grant AWS-4 authority to the incumbent MSS operators provided the Commission imposes certain conditions upon the licenses. For example, a collection of public interest organizations supports that approach so long as additional "obligations and safeguards" are imposed.[493]

168. Although most parties support the Commission's proposal, two commenters, MetroPCS and NTCH, suggest that this proposal is not the correct path. MetroPCS argues the 2003 finding that the terrestrial services and satellite services cannot be separately licensed in the same geographic area may no longer be applicable.[494] MetroPCS suggests that technical hurdles can be overcome and, therefore, at least some of the spectrum should not be licensed to the incumbent MSS operators for full terrestrial use,

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[484] Alcatel Comments at 6-7.

[485] *Id.*

[486] *See* DISH Comments, Exh. 1 (DISH Technical Study).

[487] DISH Technical Study at Section 1.5.

[488] *Id.* at Section 1.3.

[489] *Id.* at Section 3.1.

[490] *Id.* at Section 3.2.

[491] *Id.* at Section 3.1.

[492] *E.g.*, Sprint Comments at 14-15; Greenwood Comments at 10; Alcatel Comments at 6.

[493] PIO Comments at 2. We address these proposed conditions in the Regulatory Issues section, below. *See infra* Section III.G.7 (Other Matters—Proposed Party Conditions).

[494] MetroPCS Comments at 2-3.

but rather assigned via competitive bidding.[495] According to MetroPCS, interference concerns of sharing spectrum are illusory because there is no requirement that MSS be offered, and it is likely that only terrestrial services will be used in the 2 GHz spectrum bands.[496] Whereas MetroPCS argues technical hurdles can be overcome, NTCH argues that accepting competing applications for the AWS-4 licenses is in the public interest.[497] NTCH also argues the proposed modification of the MSS incumbents' licenses would result in an unjustified windfall and a loss to the public.[498]

2. Discussion—Section 316 License Modification

169. As discussed below, we reaffirm the Commission's earlier technical findings regarding same-band, separate operator sharing between mobile satellite and terrestrial operations in this band. We believe that such a sharing scenario generally remains impractical at this time and would inappropriately affect the rights of the existing MSS authorization holders.[499] Evidenced by the broad support among commenters for the proposed license modification approach, we conclude that the Commission's initial proposal to grant terrestrial authority to operate in the AWS-4 band to the current 2 GHz MSS licensees, through Section 316 license modifications, is appropriate and will serve the public interest, convenience, and necessity.

170. Of the numerous parties who commented on this issue, only NTCH opposes the license modification procedure outright.[500] We disagree with NTCH, and explain our reasoning below.

a. Legal Authority

171. In the *AWS-4 NPRM*, the Commission proposed modifying the 2 GHz MSS licensees' authority to operate in the AWS-4 bands by adding the authority to operate Part 27 terrestrial services.[501] This approach is consistent with the Commission's broad license modification authority, existing precedent, and the record. We therefore adopt the Commission's proposal to issue an *Order of Proposed Modification*, which accompanies this *Report and Order*, to modify the existing 2 GHz MSS licenses to include terrestrial operating authority in the AWS-4 spectrum upon the effective date of the service rules adopted herein.

172. Section 316 grants the Commission authority to modify a license if the modification promotes "the public interest, convenience, and necessity."[502] The D.C. Circuit has explained the authority granted by Section 316 to be a "broad power to modify licenses; the Commission need only find that the proposed modification serve the public interest, convenience and necessity."[503] This broad nature

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[495] *Id.* at 29-35. (MetroPCS proposes two alternatives for consideration: (1) the existing 2 GHz MSS licensee relinquish 20 megahertz of spectrum, which would then be auctioned; or (2) 2 GHz MSS licensee relinquish 30 megahertz of spectrum in the top 100 MSAs). *Id.*

[496] MetroPCS Comments at 35.

[497] NTCH Comments at 3-7.

[498] *Id.* at 1, 3-7; *see also* T-Mobile Comments at 18-20, U.S. Cellular Reply Comments at 5-6.

[499] *See infra* Section III.D.2.a.ii. (Public Interest Considerations); *ATC Report and Order*, 18 FCC Rcd at 1991-92 ¶ 49; *see also AWS-4 NPRM*, 27 FCC Rcd at 3583-84 ¶ 69.

[500] NTCH Comments at 3.

[501] *AWS-4 NPRM*, 27 FCC Rcd 3585 ¶ 75.

[502] 47 U.S.C. § 316(a)(1).

[503] *California Metro Mobile Communications v. FCC*, 365 F.3d 38, 45-46 (D.C. Cir 2004) (*CMMC*) (determining that the Commission had acted within its authority and that its license modification served the public interest, even though the analysis on which the Commission based its decision showed potential rather than actual interference).

includes eliminating harmful interference, or the potential for such interference, as an accepted basis for ordering wholesale license modifications.[504]

173. Numerous commenters support the Commission's proposal to exercise this authority here.[505] For example, PIO states that the Commission "has ample legal authority under Title III…to modify spectrum licenses at any time."[506] DISH comments that the license modification is consistent with both FCC precedent and the Communications Act, and that it is within the Commission's purview to modify the authorizations under Section 316.[507] Globalstar states that courts have confirmed the broad nature of Congress's grant of authority under Section 316 to modify licenses when doing so serves the public interest.[508] Moreover, even MetroPCS, who opposes, in part, the proposed approach, comments that the Commission is within its authority to modify licenses in order to improve spectrum utilization.[509]

174. Grant of AWS-4 terrestrial operating authority to the 2 GHz MSS licensees will expand the amount of spectrum available for stand-alone terrestrial mobile broadband by 40 megahertz, while also reducing the potential for interference between existing satellite and new terrestrial operations in the band.[510] Both reducing potential interference and increasing spectrum available for mobile broadband serve the public interest. To further ensure that modifying these licenses serves the public interest, we impose performance requirements and other license conditions, which will help to ensure the AWS-4 spectrum is used to provide consumers with mobile broadband service.[511] Therefore, as explained in greater detailed below, we conclude both that the Commission has the authority under Section 316 to modify the 2 GHz MSS licenses to add terrestrial rights and that so modifying these licenses will serve the public interest.

175. As discussed herein, the Commission is proposing to modify the 2 GHz MSS licenses to establish more uniform configuration and duplex spacing, one that will be consistent with the configuration of the spectrum for terrestrial use.[512] We undertake this modification pursuant to Section 316, which provides the Commission with the authority to modify licenses, including by rearranging licensees within a spectrum band.. As evidenced by the 800 MHz proceeding, for example, the Commission previously has exercised this authority to modify a license to include authority to operate on new frequencies—there the Commission modified Nextel's authorization to add the 1990-1995 MHz

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[504] *See CMMC*, 365 F.3d at 41. Furthermore, courts have determined that the Commission is within its authority to make modifications even without an application from the licensee. *See Peoples Broadcasting Co. v. United States*, 209 F.3d 286, 288 (D.C. Cir. 1953) (upholding the Commission's authority to modify a television station license without an application by the licensee for such a modification and observing that "if modification of licenses were entirely dependent upon the wishes of existing licensees, a large part of the regulatory power of the Commission would be nullified.").

[505] *See, e.g.*, Globalstar Reply at 4-5; Sprint Reply at 15; USGIC Comments at 3-4; CCIA Comments at 2-5, CCIA Reply at 2.

[506] PIO Comments at 7-8.

[507] DISH Comments at 15-16, DISH Reply at 2.

[508] Globalstar Reply at 4-5 (*citing CMMC*, 365 F.3d at 44-45).

[509] MetroPCS Comments at 36-38; MetroPCS Reply Comments at 6-8.

[510] *See supra* Sections III.A. (Band Plan), III.B. (Technical Issues).

[511] *See* Section III.E. (Performance Requirements).

[512] *See supra* Section III.A. (Band Plan)

band.[513] Additionally, the Commission modified licenses to relocate operations of certain Digital Electronic Message Service licensees from the 18 GHz band to the 24 GHz band, in order to accommodate Department of Defense military systems.[514] In modifying licenses to rearrange the MSS duplex spacing, the Commission must meet the public interest, convenience, and necessity requirements of Section 316, which we do here for the reasons detailed below.[515] Here, our action to reconfigure an existing band among existing licensees is of a much more limited nature than in previous exercises of Section 316 authority, such as the 800 MHz re-banding for Nextel. Indeed, although the 2000-2020 MHz and 2180-2200 MHz bands are currently assigned to two different licensees, Gamma Acquisitions L.L.C. (Gamma) and New DBSD Satellite Services G.P. (New DBSD), both of these licensees are wholly owned subsidiaries of DISH.[516] As the satellites are under common control, the modification and resulting recalibration of the satellites should present a minimal burden to the existing licensees. We direct these licensees to determine how to effectuate the reconfiguration of the 2 GHz MSS band into an A-B/A-B arrangement. Providing the licensees with the ability to determine how to best effectuate the MSS band reconfiguration should further limit any burden the reconfiguration places on them. Thus, we will modify the respective licenses of Gamma and New DBSD to reflect the assignment of the paired spectrum as 2000-2010 MHz paired with 2180-2190 MHz and 2010-2020 MHz paired with 2190-2200 MHz, based on the licensees' responses to the Order of Proposed Modification herein.

b. Public Interest Considerations

176. In the *AWS-4 NPRM*, the Commission expected modification of the 2 GHz MSS licenses would yield certain public interest benefits, including the removal of regulatory barriers that impede the Commission's goal of terrestrial mobile broadband services in the 2 GHz band.[517] The Commission proposed that if current technology did not permit separate MSS and terrestrial mobile licensees, then license modifications pursuant to Section 316 would make more spectrum available for broadband use and avoid harmful electromagnetic interference.[518] As discussed below, to benefit the public interest, we adopt our proposal to modify the 2 GHz MSS licenses pursuant to Section 316.

177. *Making More Spectrum Available for Flexible Mobile Use.* As the Commission has observed, the availability and quality of wireless broadband services is likely to become constrained if additional spectrum is not made available to enable network expansion and technology upgrades.[519] The National Broadband Plan notes that, should additional mobile terrestrial spectrum not become available, the result could be higher prices, poor service quality, an inability for the U.S. to compete effectively on

[513] Improving Public Safety Communications in the 800 MHz Band, WT Docket No. 02-55, ET Docket Nos. 00-258 and 95-18, RM-9498, RM-10024, *Memorandum Opinion and Order*, 20 FCC Rcd 16015, 16045 ¶ 69 (2005) (*800 MHz Order*); *see also* Establishing Rules and Policies for the Use of Spectrum for Mobile Satellite Services in the Upper and Lower L-Band, *Report and Order*, 17 FCC Rcd 2704 (2002) (*MSS Order*).

[514] *See* Amendment of the Commission's Rules to Relocate the Digital Electronic Message Service from the 18 GHz Band to the 24 GHz Band and to Allocate the 24 GHz Band for Fixed Service, *Order*, 12 FCC Rcd 3471 (1997).

[515] *See supra* Section III.A.2. (Spectrum Block and Duplex Spacing); *see infra* Section III.D.2.b. (Public Interest Considerations).

[516] *See* DBSD North America, Inc. Debtor-in-Possession; New DSD Satellite Services G.P., Debtor-in-Possession; Pendrell Corporation, Transferor; and TerreStar License Inc., Debtor-in-Possession; Assignor, and DISH Network Corporation, Transferee; and Gamma Acquisition L.L.C.; Assignee, IB Docket No. 11-150, *Order*, 27 FCC Rcd 2250 (2012).

[517] *AWS-4 NPRM*, 27 FCC Rcd at 3586 ¶ 76; *National Broadband Plan* at 87-88.

[518] *AWS-4 NPRM*, 27 FCC Rcd at 3586 ¶ 76.

[519] *See supra* Section II.A. (The Growing Spectrum Demands of Mobile Broadband Services).

an international basis, depressed demand and, ultimately, a drag on innovation.[520] Although the Commission previously envisioned the 2 GHz MSS band being available to respond to the demand for spectrum, including through the development of the ATC regime,[521] to date commercial use of this spectrum remains virtually non-existent.[522] Therefore, to improve the public interest benefits of the 2 GHz spectrum, the Commission proposed authorizing terrestrial operations in this spectrum.[523] Granting the 2 GHz MSS operators the ability to provide more and better services to both existing and potentially new subscribers with the same amount of spectrum improves the efficiency with which they can use the spectrum. For example, DISH has commented that use of this spectrum for satellite service is most likely to be in conjunction with terrestrial service.[524]

178. We emphasize that, although our determination to grant AWS-4 authority to the incumbent 2 GHz MSS licensees will undoubtedly result in an increase in value of those licensees,[525] such increase in value is not a basis for our decision today; rather, it is a consequence of our decision, which is intended to enable AWS-4 spectrum to be meaningfully and timely put to use in a manner that promotes the public interest. (We believe that various aspects of the rules we are adopting will create additional public benefits in consideration of the increase in the spectrum value.) We deem the Section 316 license modification approach the best and fastest method for bringing this spectrum to market, a position underscored by commenters.[526] Thus, we conclude Section 316 license modifications are in the public interest.

179. Additionally, the technical requirements that we are adopting today for 2000-2005 MHz operations will help make the adjacent band, 1995-2000 MHz, available for terrestrial, flexible use, including for mobile broadband use. The Commission allocated 1995-2000 MHz for fixed and mobile use in 2003 and designated it for AWS use in 2004 as a downlink band paired with 1915-1920 MHz.[527] The existence of uplink operations adjacent to downlink operations, however, raises interference concerns; we resolve those through the establishment of technical and interference rules above.[528] Further, the Spectrum Act requires the Commission to license the 1995-2000 MHz band under flexible

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[520] *See National Broadband Plan* at 77.

[521] *See* Establishment of Policies and Service Rules for the Mobile Satellite service in the 2 GHz Band, IB Docket No. 99-81, *Report and Order*, 15 FCC Rcd 16127 (2000); *see also* ATC Order at ¶ 12 (adding ATC authority to the 2 GHz MSS band and concluding that "the public interest is best served by permitting MSS licensees flexibility to improve MSS by having the option of deploying MSS ATC to improve spectrum efficiency and achieve other public-interest goals, particularly given that our technical analyses demonstrate that we cannot grant to a third party the right to use licensed MSS spectrum for terrestrial use without impacting the rights of the existing satellite licensees.").

[522] *AWS-4 NPRM*, 27 FCC Rcd at 3565-66 ¶ 8.

[523] *Id.* at 3586 ¶ 78.

[524] *See* Letter from Jeffrey H. Blum, DISH, to Marlene H. Dortch, Sec'y, FCC, WT Docket Nos. 12-70 and 04-356, ET Docket No. 10-142, at 2-3 (filed Aug. 28, 2012). Many commenters also emphasize the benefits that will follow the authorization, such as freeing up spectrum, benefitting consumers, and meeting goals established in the *National Broadband Plan*. *E.g.*, TIA Comments at 6; Alcatel Comments at 4-5; and CCIA Reply at 4-6 (arguing the grant of authority to the 2 GHz MSS licensee will help to fuel job growth and the economy).

[525] NTCH Comments at 1, 3-7; *see also* T-Mobile Comments at 18-20, U.S. Cellular Reply Comments at 5-6; PIO Comments at 7 (stating that AWS-4 licenses could be valued at $4 to $6 billion).

[526] *See, e.g.*, DISH Reply at 17-18; Alcatel Comments at 2, 5.

[527] *See* AWS *AWS Sixth Report and Order*, 19 FCC Rcd at 20740 ¶ 41 (pairing two bands).

[528] *See supra* Section III.B. (Technical Issues).

use service rules, unless doing so would cause interference to PCS licensees in the 1930-1995 MHz band.[529] Enabling this band to be used efficiently for flexible, commercial use is consistent with this statutory requirement. Moreover, as explained above, wireless broadband traffic is asymmetrical with more downlink than uplink; thus the public interest is best served by limiting uplink operations at 2000-2005 MHz to facilitate potential downlink operations at 1995-2000 MHz, particularly where such a downlink band could become part of the workhorse PCS band.[530] Accordingly, we conclude Section 316 license modifications are in the public interest.

180. Finally, we disagree with NTCH's assertion that the license modification approach we take is not in the public interest. NTCH argues the Commission's proposed actions are inappropriate and that we should accept competing applications for AWS-4 spectrum. NTCH, however, ignores the critical detail that same-band, separate operator sharing of the spectrum is not technically feasible at this time. Moreover, nothing we do today eliminates the existing mobile satellite allocation for the 2 GHz MSS band[531] or limits the licensees' continued satellite use rights for this spectrum (other than certain targeted technical restrictions applicable to 2000-2005 MHz). The Commission recognized these technical hurdles when it established co-primary fixed and mobile allocations in the 2 GHz band. Therefore, to make more spectrum in this band available for flexible terrestrial use, including for mobile broadband, and thereby serve the public interest, we will authorize AWS-4 operations by the incumbent 2 GHz MSS licensees through license modifications.[532]

181. *Eliminating Harmful Interference.* The Commission previously determined that separately controlled MSS and terrestrial operations (*i.e.*, two ubiquitous mobile services) in the same band would be impractical because the parties would not be able to overcome the technical hurdles to reach a workable sharing arrangement.[533] This determination suggested that the public interest would be best served by modifying the 2 GHz MSS license to allow the satellite licensee to operate terrestrial services, rather than make the band available for terrestrial licenses under a sharing regime with MSS.[534] As discussed below, the record demonstrates that the earlier Commission conclusion regarding the impracticality of allowing same spectrum, different operator use of the AWS-4 spectrum remains valid.[535] The majority of commenters discussing this issue concur with the Commission's assessment that harmful interference would occur if the 2 GHz MSS and AWS-4 terrestrial spectrum rights were controlled by different entities.[536] Thus, we conclude that the public interest is best served by modifying the 2 GHz MSS license rather than allowing shared use of the band. Accordingly, based on the record before us at this time, we decline to assign AWS-4 terrestrial rights through a system of competitive bidding.[537]

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[529] *See* Spectrum Act § 6401(b), codified at 47 U.S.C. § 1451(b).

[530] *See supra* Section III.B. (Technical Issues).

[531] *See 2 GHz Band Co-Allocation Report and Order,* 26 FCC Rcd 5710 (2011).

[532] To the extent NTCH suggests the Commission remove the MSS allocation in the 2 GHz band, we consider that request to be an untimely Petition for Reconsideration of the *2 GHz Band Co-Allocation Report and Order*. *See* 47 C.F.R. §1.429.

[533] *ATC Report and Order*, 18 FCC Rcd at 1991 ¶ 49.

[534] *AWS-4 NPRM*, 27 FCC Rcd 3586-87 ¶ 79.

[535] *See infra* Section III.D.2.b. (Public Interest Considerations).

[536] *See, e.g.*, DISH Comments at 4, 9-10; NRTC Comments at 4-5; USGIC Comments at 3.

[537] *See AWS-4 NPRM*, 27 FCC Rcd at 3587 ¶ 80.

182. One party opposes the Commission's proposal that shared use of the AWS-4 spectrum remains infeasible. MetroPCS argues that the current technology environment actually allows for sharing the AWS-4 spectrum between different operators.[538] MetroPCS suggests that use of known technologies, such as advance coding and interference cancellation and mitigation techniques, would allow for greater interference protection for satellite handsets from terrestrial broadcasts.[539] Additionally, MetroPCS asserts that because MSS satellites "are essentially 'bent pipes,' satellite and terrestrial operators will be able to coordinate their systems in a way that was not originally contemplated when the Commission decided that sharing was not feasible." Although MetroPCS is correct that DISH's satellites use a "bent pipe" architecture where the satellite is essentially repeating a signal generated on the ground, MetroPCS does not clarify how this would facilitate coordination. Contrary to MetroPCS's assertions, we find the record demonstrates continued technical hurdles exist. As DISH notes, although such technologies do allow for greater interference protection, they are "*only* feasible when operations are integrated . . . [and] the reverse link interference cancellation technique…is not a viable solution in the absence of integration, as it requires real-time knowledge of signals for this interference to be prevented."[540] Similarly, as NRTC notes, the technology necessary to share spectrum between two separate licensees, such as dynamic spectrum access and cognitive radios, is not market-proven for sharing mobile satellite and terrestrial operators or addressed in relevant technical standards.[541] Other parties, such as US GIC, comment that the Commission correctly concluded that multiple parties would not be able to overcome technical hurdles.[542]

183. Also, the record contains no evidence that dynamic frequency coordination can be achieved today between separately-controlled MSS and terrestrial networks. Indeed, as DISH notes, no commenter—including MetroPCS—provides technical support that disputes the continued validity of the Commission's 2003 finding.[543] Rather, as Sprint states, the record engineering analysis presented by DISH "credibly indicates that frequency sharing between separate operations could cause interference between AWS-4 and MSS equipment and transmissions."[544] Thus, we find that spectrum sharing between separately-licensed MSS and terrestrial operators, while perhaps possible in the future, is not viable today in this spectrum band.[545] Consequently, we conclude that substantial technical hurdles remain, justifying authorizing AWS-4 operations by the incumbent MSS licensees.[546]

184. We emphasize that this public interest determination is based in part on rules that will limit or potentially limit the licensees' terrestrial use of a five megahertz portion of AWS-4 spectrum to facilitate the use of 1995-2000 MHz.[547] In particular, as explained above, we are imposing increased OOBE limits at and below 2000 MHz, reduced power limits for mobile terrestrial operations in 2000-

[538] MetroPCS Comments at 2-3, 14, 19-22, 33-35.

[539] *Id.* at 20.

[540] DISH Reply Comments at 6-7, emphasis in original.

[541] NRTC Comments at 4.

[542] USGIC Comments at 4.

[543] DISH Reply at 6-7.

[544] Sprint Reply at 14.

[545] Globalstar Comments at 6; Globalstar Reply at 2.

[546] Having determined to modify the incumbent 2 GHz MSS licensee's authorization to permit it terrestrial use of the AWS-4 spectrum, we decline to pursue other assignment approaches, such as assigning the terrestrial use through competitive bidding. *See AWS-4 NPRM*, 27 FCC Rcd at 3587 ¶ 80.

[547] *See supra* Section III.B. (Technical Issues).

2005 MHz, and requiring an AWS-4 A block licensee to accept interference from duly authorized lawful operations in the 1995-2000 MHz band .[548] We do this to protect future operations in the 1995-2000 MHz band from harmful interference, to ensure the possibility of flexible commercial use of that band, consistent with Congressional direction, and to strike a balance in ensuring the efficient use of all relevant spectrum bands. The Communications Act established "that the Commission's powers are not limited to the engineering and technical aspects of radio communications."[549] Rather, the Communications Act directs the Commission to "'encourage the larger and more effective use of radio in the public interest'" and to adopt "'such rules and regulations and prescribe such restrictions and conditions . . . as may be necessary to carry out the provisions of this Act.'"[550] As explained above, we deem it necessary to set these technical limits to best maximize AWS-4 and 1995-2000 MHz spectrum for flexible terrestrial use by minimizing harmful interference between the bands. We believe the technical rules we adopt today to protect against harmful interference will promote more effective and efficient use of the 1995-2000 MHz band and the AWS-4 band and we believe that the benefits of these rules will outweigh any restrictions on the use of a portion of the AWS-4 uplink band. Moreover, any restrictions on the use of a portion of the AWS-4 band would be more than offset by the considerable increase in flexibility that the authorization holders will receive in obtaining overall terrestrial use rights under the Commission's Part 27 flexible use rules instead of under the existing ATC rules.[551]

185. Commenters did not offer specific data on the amount of benefits or costs associated with our proposed authorization of AWS-4 operations by the incumbent MSS licensees. However, because of the technical difficulties associated with coordinating between different AWS-4 licensees and the MSS licensee using the shared spectrum in the same service area, and the requirement discussed above for licensees of AWS-4 operating authority to protect 2 GHz MSS operations from harmful interference, and given the record before us and the benefits discussed above, we conclude that the potential benefits of assigning the AWS-4 spectrum rights to the existing 2 GHz MSS licensees would outweigh any potential costs.

3. Proposed Modification

186. For the reasons discussed throughout this Report and Order, we conclude that it is in the public interest, convenience, and necessity to propose modifying the existing 2 GHz MSS licenses as described in Section V below.[552] These modifications include adding Part 27 terrestrial spectrum rights to the 2 GHz MSS licenses, creating more uniform duplex spacing for the MSS rights, and eliminating ATC authority from the licenses. In the unexpected event that the license modification fails to become effectuated, we will take appropriate action at that time, potentially including full reconsideration of the assignment methods contemplated in this item and based on the revised factual scenario such an occurrence would represent.

E. Performance Requirements

187. The Commission establishes performance requirements to promote the productive use of spectrum, to encourage licensees to provide service to customers expeditiously, and to promote the

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[548] *Id.*

[549] *NBC*, 319 U.S. at 215.

[550] *Id.* at 217 (quoting 47 U.S.C. §§ 303(g) & (r)).

[551] NTCH Comments at 1, 3, 7; *see also* T-Mobile Comments at 18-20; U.S. Cellular Reply Comments at 5-6; PIO Comments at 7 (stating that AWS-4 licenses could be valued at $4 to $6 billion.).

[552] *See infra* Section V. (Order of Proposed Modification).

provision of innovative services throughout the license area(s), including in rural areas.[553] Historically, the Commission tailors performance and construction requirements to the unique characteristics of the spectrum band at issue.[554] For the AWS-4 band, we adopt performance requirements that will ensure that the spectrum is put to use expeditiously, while providing licensees with the flexibility needed to deploy services according to their business plans. Specifically, we require:

- *AWS-4 Interim Build-out Requirement*: Within four (4) years, a licensee shall provide reliable terrestrial signal coverage and offer terrestrial service to at least forty (40) percent of its total AWS-4 population. A licensee's total AWS-4 population shall be calculated by summing the population of each of its license areas in the AWS-4 band.
- *AWS-4 Final Build-out Requirement*: Within seven (7) years, a licensee shall provide reliable terrestrial signal coverage and offer terrestrial service to at least seventy (70) percent of the population in each of its license areas.

188. Additionally, we adopt the following penalties for failing to meet the build-out benchmarks:

- *Failure to Meet AWS-4 Interim Build-out Requirement*: Where a licensee fails to meet the aggregate AWS-4 Interim Build-out Requirement, the AWS-4 Final Build-out Requirement shall be accelerated by one year (from seven to six years).
- *Failure to Meet AWS-4 Final Build-out Requirement*: Where a licensee fails to meet the AWS-4 Final Build-out Requirement in any EA, its authorization for each EA in which it fails to meet the requirement shall terminate automatically without Commission action. To the extent that the licensee also holds the 2 GHz MSS rights for the affected license area, failure to meet the AWS-4 Final Build-out Requirement in an EA shall also result in the MSS protection rule in section 27.1136 of the Commission's rules no longer applying to that EA.

We explain the rationale for these performance requirements below.

1. Background

189. The AWS-4 band is allocated on a co-primary basis for both mobile satellite and terrestrial use and the Commission has previously granted MSS authorizations, including ATC authority, for 2 GHz MSS spectrum.[555] Given these unique circumstances, and the proposed Section 316 license modifications, the Commission proposed, as an interim terrestrial build-out requirement, to require that, within three years, a licensee must provide terrestrial signal coverage and offer terrestrial service to at least thirty percent of its total license-area population.[556] The Commission proposed to calculate a licensee's total AWS-4 population by summing the population of each EA license authorizations in the band.[557] As a final build-out requirement, the Commission proposed that, within seven years, the licensee must provide signal coverage and offer service to at least seventy percent of the population in each EA it holds.[558] The Commission proposed an aggregate license-area requirement for the interim milestone to

[553] *See* Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, *Second Report and Order*, 22 FCC Rcd 15289 at 15348 ¶ 154 (2007) (*700 MHz Second Report and Order*).

[554] *See e.g., 700 MHz Second Report and Order*, 22 FCC Rcd at 15348-15355 ¶¶ 153-77.

[555] *AWS-4 NPRM*, 27 FCC Rcd at 3563-3566 ¶¶ 3-9.

[556] *Id.* at 3590 ¶ 92.

[557] *Id.* at 3590 ¶ 92.

[558] *Id.* at 3590 ¶ 92.

provide a licensee with flexibility in the initial build of its network, and it proposed EA-based requirements for the final milestone in order to encourage widespread deployment throughout many areas of the country.[559]

190. In the *AWS-4 NPRM*, the Commission sought comment on specific penalties in the event a licensee fails to satisfy its terrestrial build-out requirements.[560] The Commission proposed and sought comment on whether all of a licensee's terrestrial spectrum rights should terminate automatically without Commission action if a licensee fails to meet the interim build-out requirement.[561] The Commission also sought comment on whether in the event a licensee fails to meet the final build-out requirement in any license area, its terrestrial spectrum rights for each license area in which it fails to meet the build-out requirement should terminate automatically without Commission action.[562] The Commission observed that, if it assigns AWS-4 terrestrial spectrum rights to the 2 GHz MSS licensee pursuant to a Section 316 license modification, the license would include both Part 27 terrestrial and Part 25 mobile satellite rights.[563] In such a situation, the Commission proposed that failure to meet the interim build-out requirement would result in the AWS-4 and 2 GHz MSS spectrum rights automatically terminating in all license areas (*i.e.*, nationwide, if a single licensee holds all of the authorizations), and failure to meet the final build-out requirement would result in the AWS-4 and 2 GHz MSS spectrum rights automatically terminating in those areas where the licensee fails to meet the requirement.[564]

191. Furthermore, in case a licensee's terrestrial authority to operate terminates, the Commission sought comment on the process for making terrestrial spectrum rights available for reassignment pursuant to the competitive bidding provisions of Section 309(j).[565] The Commission observed that its ability to reassign the spectrum rights could be impaired should the Commission continue to require coordination and protection of 2 GHz MSS operations by licensees of reassigned terrestrial spectrum rights.[566] The Commission sought comment on the appropriate remedy in such circumstances.[567]

192. Finally, the Commission proposed and sought comment on whether, consistent with Section 1.946(d) of the Commission's rules, licensees must demonstrate compliance with any new performance requirements by filing a construction notification within 15 days of the relevant milestone certifying that they have met the applicable performance benchmark.[568] The Commission also proposed to require additional detailed supporting documentation, including electronic coverage maps, for each construction notification.[569]

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[559] *Id.* at 3591 ¶ 93.

[560] *Id.* at 3591-92 ¶¶ 94-96.

[561] *Id.* at 3591 ¶ 94.

[562] *Id.* at 3591 ¶ 94.

[563] *Id.* at 3591 ¶ 95.

[564] *Id.* at 3591 ¶ 95.

[565] *Id.* at 3592 ¶ 96; *see* 47 U.S.C. § 309(j).

[566] *Id.* at 3592 ¶ 96; *see* 47 U.S.C. § 316.

[567] *Id.* at 3592 ¶ 96.

[568] *AWS-4 NPRM*, 27 FCC Rcd at 3592 ¶ 97; *see* 47 C.F.R. § 1.946(d) ("notification[s] must be filed with Commission within 15 days of the expiration of the applicable construction or coverage period").

[569] *AWS-4 NPRM*, 27 FCC Rcd at 3592 ¶¶ 97-98.

2. Discussion

193. We adopt specific performance requirements for the AWS-4 band in an effort to foster timely deployment of flexible terrestrial mobile service in the band, and to enable the Commission to take appropriate corrective action should the required deployment fail to occur. Although the record in response to the Commission's specific performance benchmark and penalty proposals is mixed, parties generally agree that performance requirements promote the timely, productive use of spectrum. For example, Alcatel-Lucent states that "reasonable deployment milestones ensure that the spectrum actually gets used in the near term."[570] Timely deployment of wireless networks in this band is vital given the failure of any terrestrial ATC service and failure of significant MSS to develop despite years of Commission effort to enable deployment of emerging and innovative technologies in the band.[571]

194. We disagree with commenters who argue that our build-out requirements "would be of limited value,"[572] because they either do not believe the licensee (post license modification) intends to build out using the spectrum or believe that additional conditions are needed to ensure the spectrum is utilized.[573] As an initial matter, we observe that the incumbent 2 GHz MSS licensees generally support our seven year end-of-term build-out benchmark and have committed to "aggressively build-out a broadband network" if they receives terrestrial authority to operate in the AWS-4 band.[574] We expect this commitment to be met and, to ensure that it is, adopt performance requirements and associated penalties for failure to build-out, specifically designed to result in the spectrum being put to use for the benefit of the public interest. We address requests for conditions in addition to performance requirements in section III.G.7., below.

a. Benchmarks

195. To ensure that a licensee provides service to consumers expeditiously, we adopt specific quantifiable performance requirements. Consistent with our approach to performance benchmarks in other bands—including the Upper 700 MHz C-block and the 2.3 GHz WCS band—we adopt objective interim and final build-out benchmarks.[575] As explained below, after taking into account the full range of comments, we adopt an interim requirement that differs somewhat from that proposed in the *AWS-4 NPRM* and adopt the final benchmark proposal in the *AWS-4 NPRM*.

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[570] Alcatel Comments at 16.

[571] *AWS-4 NPRM*, 27 FCC Rcd at 3563-3566, ¶¶ 3-9. Although TerreStar, a predecessor 2 GHz MSS licensee to DISH, previously offered MSS service to a limited number of customers in an arrangement with AT&T, there is no indication from the current licensee's web site that any service is presently offered to consumers in the 2 GHz MSS band. *See* URL: http://www.dish.com (last visited Nov. 30, 2012).

[572] MetroPCS Comments at 27.

[573] *Id.* at 27-29; PIO Comments at 17-19; RCA Comments at 4-5, 11-12.

[574] DISH Comments at 18; *but see*, MetroPCS Comments at 28 (arguing that DISH "lacked detail regarding its plans to obtain the necessary technical, operational and business expertise to construct and operate a terrestrial network, as well as how it planned to compete against the nationwide carriers."); MetroPCS Reply Comments at 8-9.

[575] *See 700 MHz Second Report and Order*, 22 FCC Rcd at 15351 ¶¶ 163-64. Although the C Block was licensed by REAG, the rules require C Block licensees to meet these benchmarks in each EA. 47 C.F.R. § 27.6(b)(2). We decline to use the AWS-1 band as a basis for the performance requirements we adopt here. Build-out requirements for AWS-1 spectrum took into account the uncertainty associated with the timing of clearing Federal operations from the band, which does not need to occur here. *See AWS-1 Report and Order*, 18 FCC Rcd at 25191-93 ¶¶ 73-79.